IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. Of: MURAKAMI et al.

Serial No. 10/569,581

Filed: February 23, 2006

For: MAGNUS TYPE WIND POWER GENERATOR

DOCKET: SHIG CP10AP04AK CONFIRMATION NO. 5729

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 CFR 1.132

Dear Sir:

The undersigned declares and states as follows:

(1) This Declaration is being filed in support of the above-identified Application Serial No. 10/569,581 (the '581 Application). My CV is attached as Exhibit A.

(2) I understand the '581 Application has been rejected as being obvious over a combination of prior art patents including WO 02/42640 to Terracina (hereinafter Terracina). As a man skilled in the art I recognize there are several structural differences between the present claimed invention and Terracina. Moreover, these differences result in significant performance advantages of the present invention over Terracina. In this regard I conducted experiments using a model of a wind generator made in accordance with the teachings of Terracina

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and a wind generator made in accordance with the invention claimed in the '581 application. The results of my tests are described in the attached Exhibit B which clearly demonstrates significant aerodynamic advantages of the blade structure made in accordance with the invention claimed in the '581 Application over blade structure of Terracina.

I hereby declare that all statements made hereof of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of our application or any patent issued thereon.

By: 村上信博 Date: 9/3/2008
Nobuhiro MURAKAMI

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EXHIBIT A

(translation)

Profile

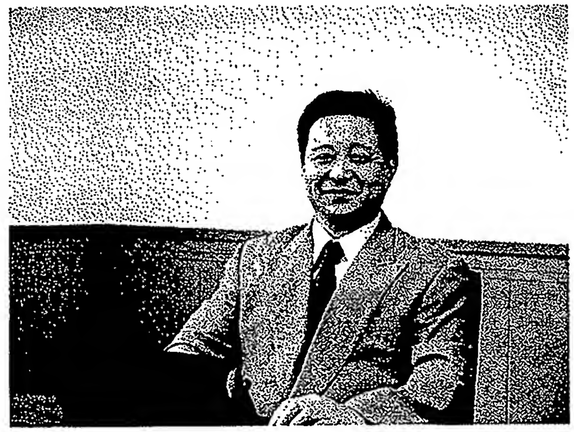
Nobuhiro MURAKAMI
MECARO CO., LTD.
President and Representative Director

1962 Born in Akita
1984 Graduated from Akita National College of Technology
(Major: Fluid Engineering)
1984 Joined Suzuki Akita Auto Parts MFG Co., Ltd.
Manufacturing Technology (4 years)
Development, Develop 4WD free-wheel hub (1 year)
1989 Joined OSE Ltd.
3-dimension-die machining by Machining Center (2 years)
Factory director (4 years)
1995 Founded MEKARO AKITA
Semiconductors, Automobiles, Automated machines for medical production plants, Jigs, Die Design Fabrication etc.
1996 President, MEKARO AKITA LTD.
2004 President, MEKARO AKITA CO., LTD.
Development of Wind power generator

・Administrator : Akita National College of Technology Academic-industrial alliance
・Steering committee : Institute of Akita National College of Technology Research Incubator center for industrial collaboration and technological innovation

<u>Award-winning</u>
1997 "Stamping holder"
Director-General prize in Tohoku Bureau of Economy, Trade and Industry

プロフィール



村上　信博

株式会社 MECARO　代表取締役社長

略　歴

1962 年　秋田県生まれ
1984 年　国立秋田工業高等専門学校卒業
　　　（専攻　流体工学）
1984 年　(株)スズキ部品秋田　入社
　　　生産技術 4 年、開発 1 年(4 駆フリーホイールハブの開発)
1989 年　(有)オーエスイー
　　　マシニングセンターによる 3 次元金型加工(2 年)、工場長(4 年)
1995 年　メカロ秋田　創立
　　　主に半導体・自動車・医療関係の生産工場の自動機・治具・金型設計製作
1998 年　(有)メカロ秋田 設立　代表取締役就任
2004 年　(株)メカロ秋田 設立　代表取締役就任
　　　風力発電機の本格開発を追加

秋田工業高等専門学校産学協力会役員（幹事）
独立行政法人　秋田工業高等専門学校　地域共同テクノセンター　運営委員

受　賞

平成 9 年度、「打刻ホルダー」で秋田県発明展において東北通商産業局長賞を受賞

EXHIBIT B

Figs. 1

Engineering Sheet		Page 1/5
		MECARO
Topic	Influence on Magnus effect when spiral or vane protrusions are attached to rotating cylinder	Technical Division Author: Miura
		Released: 8/21/2008

1. Objective of experiment

The objective of the experiment is to verify the differences between the aerodynamic characteristics of Mecaro's spiral cylinder structure and those of the protruding blade structure for Terracina (Wind Generator Using Magnus Effects PCT/IT2001/000570).

2. Overview of apparatus and method used in the experiment

An overview of the apparatus used in the experiment is given below. The apparatus was a windmill used in a previous test version, and had a diameter of 2 m, a blade length of 650 mm and a blade cross-section diameter of 70 mm.

As shown, two blades are symmetrically attached to a rotor. A force sensor (see separate sheet for details) is attached to one side, and a cylindrical blade having a structure used for measurements is attached to the other side. The resulting structure measures the force acting on the cylindrical blade as torque around the support shaft. A fan is used to blow air on the cylindrical blade, which is allowed to rotate, and the lift that is generated is measured by the force sensor. Data were sampled at 2 Hz, the measurements were performed for 10 sec, and the averaged values were used as the measurement values.

Measurements were performed with cylindrical blades having five configurations: a blade with two rectangular strips wrapped in a spiral shape (Photo 2), blades with one to three sets of the form described in Terracina (Photos 3 to 5), and a blade with nothing attached to it.

The configuration described in Terracina gave no specification in regard to shape or size; therefore, a shape resembling that of the original image (Photos 8 & 9) was fabricated, with the diameter of the cylindrical blade taken into consideration. Measurements were performed with blades having such protrusions on them.

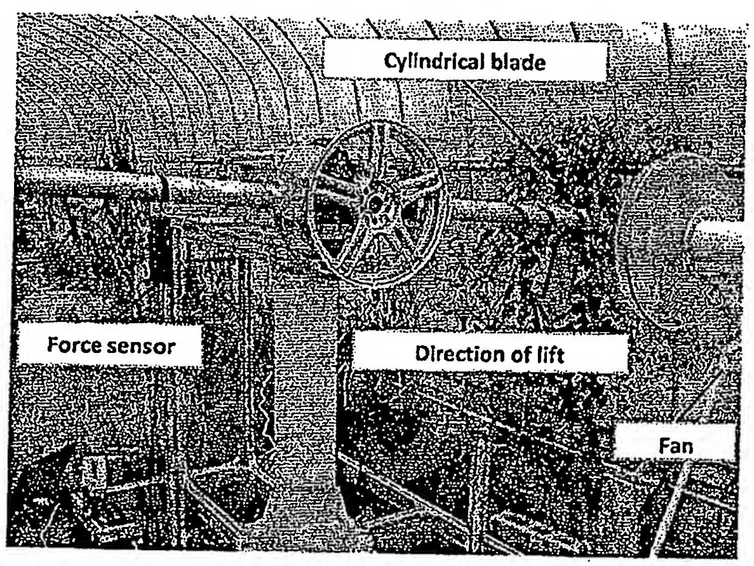


Photo 1: Overview of apparatus used in experiment

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☐ For approval	Deliver to								
☐ For reference									
☐ For investigation									
☐ For confirmation									

EXHIBIT B

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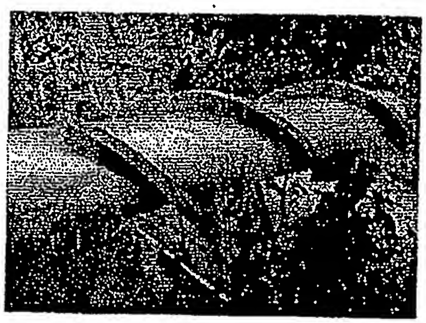

Photo 2: Spiral form

Photo 3: 1 set of vanes (patent)

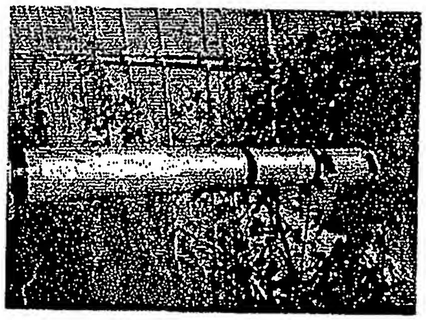

Photo 4: 2 sets of vanes (patent)

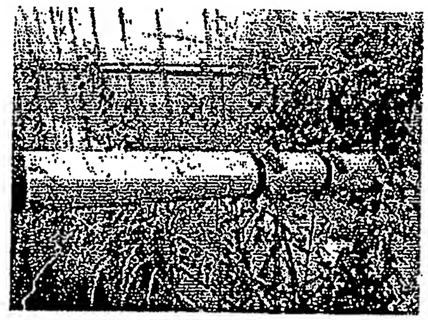

Photo 5: 3 sets of vanes (patent)

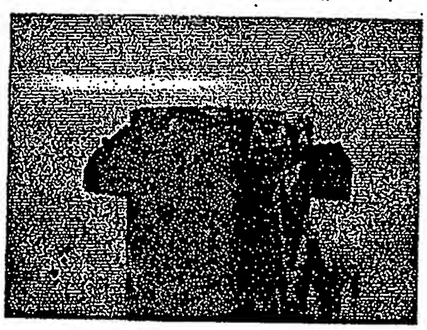

Photo 6 Detail of patent shape 1

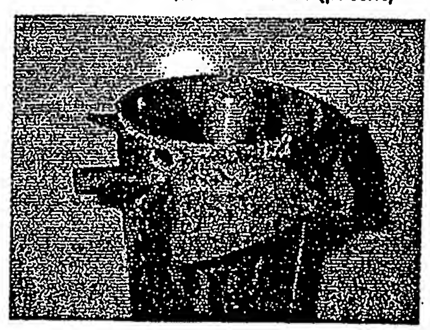

Photo 7 Detail of patent shape 2

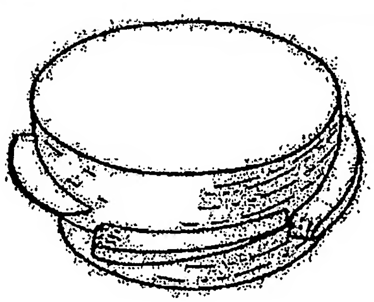

Photo 8 Original patent image 1

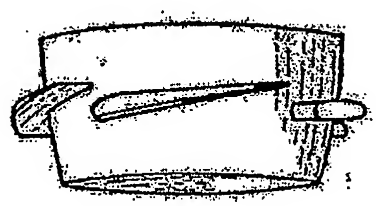

Photo 9 Original patent image 2

Engineering sheet		M ECARO	
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3. Conditions

The experiment was performed at air speeds of 4.5, 5.5, and 6.5 [m/s]. The cylindrical blades were caused to rotate at 500, 1000, 1500, and 2000 [rpm]. The measurements were performed using a digital hand tachometer (Ono Sokki). Measurements with the force sensor were performed at a sampling time of 10 [s], and a sampling frequency of 2 [Hz]. The average values were taken as the measurement values.

The instruments are described in detail below.

Force sensor

Manufacturer	:	PASCO SCIENTIFIC
Output voltage	:	–8 to +8 [V] (–50 to +50 [N])
Output noise	:	±2 mV
Force throughput	:	25 N/msec
Bandwidth limit	:	2 kz (internal low-pass filter)
Output drive	:	Capable of 8 m without instability
Resolution	:	0.0305 [N]

Hot-wire anemometer

Manufacturer	:	KANOMAX
Meas. symmetry	:	Clean air flow
Meas. range	:	0.10 to 50 [m/s]
Meas. precision	:	± (3% of specified value+0.01) m/s
Response	:	1 [s]
Operating env't.	:	5 to 40°
Mass	:	appx. 1100 g

4. Results of measurements

Figs. 1 to 3 show the results of the measurements performed under the various conditions. The x-axis shows the cylinder circumferential speed ratio θ, and the y-axis shows the coefficient of lift CL.

The cylinder circumferential speed ratio θ was obtained by dividing the cylinder rotation speed U by the air speed V, and is accordingly expressed by the following equation.

$$\theta = \frac{d\pi U}{60V}$$

d: Cylinder diameter [m]
U: Number of cylinder rotations [rpm]
V: Air speed [m/s]

The coefficient of lift CL is a dimensionless number, and is used for comparisons between vanes having different configurations. It can be expressed by the formula below.

$$CL = \frac{L}{\frac{1}{2}\rho V^2 dl}$$

L: Lift [N]
ρ: Air density
l: Length of blade [m]

Examining the results shows that when the cylindrical blade fitted with spiral vanes was used, lift started to be generated from the area with a low circumferential speed ratio, and climbed sharply when the ratio exceeded 1. This behavior has been confirmed in the past, but we were able to confirm it again on this occasion. The fact that lift could be generated even at a low circumferential speed ratio means that power can even be generated in low air speed conditions, and the data were regarded as being able to clearly show the characteristics of the Spiral Magnus.

Engineering sheet		MECARO Technical Division Author: Miura	
Topic	Influence on Magnus effect when spiral or vane protrusions are attached to rotating cylinder	Released	8/21/2008

On the other hand, with the vanes configured as described in Terracina, virtually no effect was observed in the region where the circumferential speed ratio was low, despite the fact that the lift was confirmed to be higher than when the tube had no vanes. Given that no change occurred at a low circumferential speed ratio regardless of whether 1, 2, or 3 sets of vanes were used, further improvements in lift would be unlikely to occur at a low speed ratio even if more vanes were used.

When viewed from the perspective that lift was noted to improve as the circumferential speed ratio increased, the influence on the Magnus effect was consistent; however, when the change in the shape of the graph and the behavior at lower speed ratios are taken into consideration, the spiral structure and the structure described in Terracina were different in terms of the degree of impact on the Magnus effect.

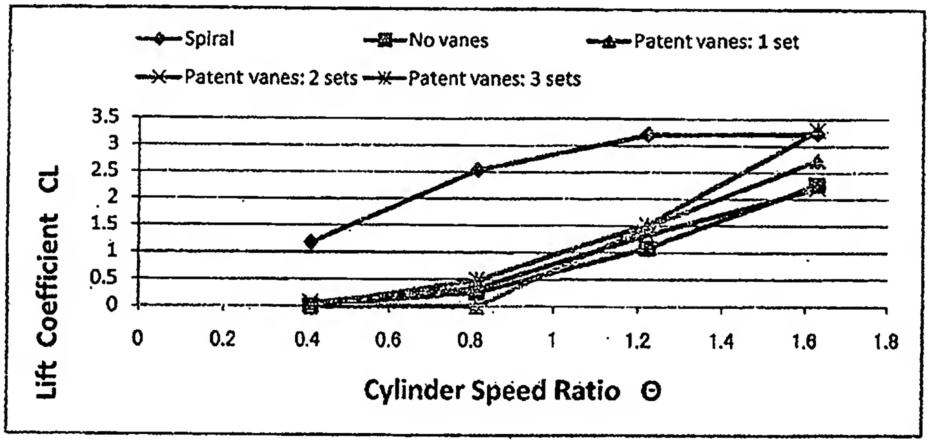

Fig. 1 Lift coefficient Comparison at air speed of 4.5 m/s

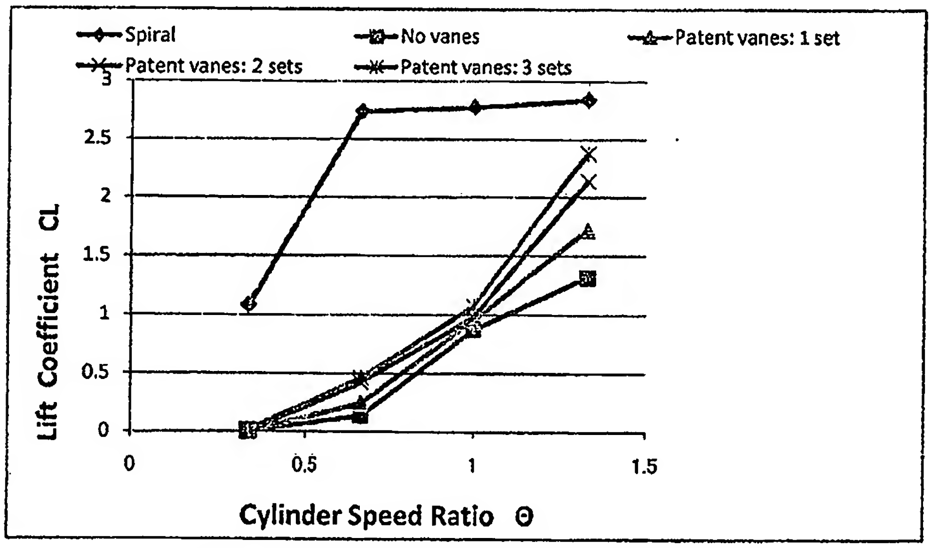

Fig. 2 Lift coefficient Comparison at air speed of 5.5 m/s

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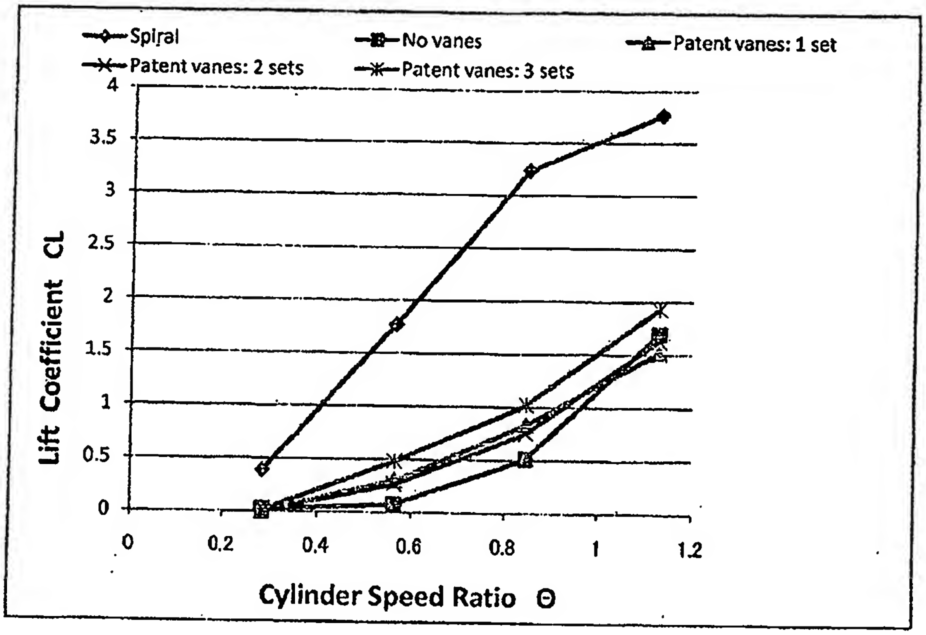

Fig. 3 Lift coefficient Comparison at air speed of 6.5 m/s